Surgical Treatment of the Tc-99m Sestamibi Negative Solitary Parathyroid Adenoma with Radioguided Occult Lesion Localization (ROLL) Technique: Case Report

Tc-99m Sestamibi Negatif Soliter Paratiroid Adenomunun 'Radioguided Occult Lesion Localization' (ROLL) Tekniği ile Cerrahi Tedavisi

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ABSTRACT A 75-year- old woman who had undergone bilateral subtotal thyroidectomy for multinodular goitre was referred to our clinic for parathyroid scintigraphy due to primary hyperparathyroidism. Dual phase ^{99m}Tc-sestamibi scintigraphy was negative for parathyroid adenoma. Ultrasonographic (USG) evaluation revealed a hypoecoic round lesion, located at the right thyroid bed and superior to the thyroid remnant, measuring 15 × 10 mm. US guided fine needle aspiration biopsy was performed. Histopathological findings were compatible with parathyroid adenoma. 1 mCi ^{99m}Tc-macro albumin aggregate was injected into the lesion under USG guidence 16 hours before the surgery. Radioguided occult lesion localization (ROLL) technique was applied for surgical excision of Tc-^{99m} sestamibi negative solitary parathyroid adenoma (SPA) under local anesthesia. In literature, this is the first report of using ROLL technique for surgical treatment of the ^{99m}Tc-sestamibi negative SPA.

Key Words: Parathyroid neoplasms; radiosurgery

ÖZET Multinodüler guatr tanısı ile bilateral subtotal tiroidektomi operasyonu geçirmiş olan 75 yaşındaki bayan hasta primer hiperparatiroidizm ön tanısı ile paratiroid sintigrafisi çekilmek üzere kliniğimize yönlendirildi. Çift zamanlı paratiroid sintigrafisinde paratiroid adenomu ile uyumlu bulgu saptanmadı. Ultrasonografik (USG) değerlendirmede sağ tiroid lojunda, bakiye tiroid dokusunun üst kısmında 15 × 10 mm boyutunda hipoekoik yuvarlak lezyon izlendi. US eşliğinde ince iğne aspirasyon biyopsisi yapıldı. Histopatolojik değerlendirme paratiroid adenomu ile uyumlu idi. Operasyondan 16 saat önce USG eşliğinde 1mCi ^{99m}Tc-macro albumin aggregat lezyon içine enjekte edildi. Tc-^{99m} sestamibi negatif soliter paratiroid adenomu radioguided occult lesion localization (ROLL) tekniği ile lokal anestezi altında cerrahi olarak çıkarıldı. Bu olgu, literatürde ROLL tekniği ile cerrahi eksizyon yapılan ilk Tc-99m sestamibi negatif soliter paratiroid adenomudur.

Anahtar Kelimeler: Paratiroid tümörleri; radyocerrahi

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Approximately 85% of all cases of primary hyperparathyroidism (PHPT) are caused by solitary parathyroid adenoma (SPA).[1] Gamma probe guided minimal invasive parathyroidectomy (GP-MIP) is a very attractive surgical approach to treat patients with PHPT secondary to SPA.[2-5] But, GP-MIP can be performed only in ^{99m}Tc-sestamibi positive SPA. The radioguided occult lesion localization (ROLL) technique has become a standard for several breast units worldwide.[6] In this study, we applied ROLL technique with ^{99m}Tc-macro albumin aggregate (MAA) for surgical treatment of ^{99m}Tc-sestamibi negative SPA case.

CASE REPORT

RADIOGUIDED LOCALISATION PROCEDURE

Human serum albumin macroaggregate (Technoscan, LyoMAA, Mallinckrodt Medical, Petten, The Netherlands) labeled with 1 mCi of freshly eluted ^{99m}Tc was injected in 0.2 ml of saline into the lesion under ultrasonography (USG) guidance. The probe was attached to a needle biopsy device which was inserted into the SPA manually. The needle tip was positioned at the center of the lesion as shown by a change in echogenicity at the lesion site; radiotracer was then injected, followed by an additional 0.2 ml of saline. Static lateral and anterior scintigraphic images were acquired 30 minutes (min) after radiotracer injection. Images were acquired collecting 500.000 counts in a 256 × 256 pixel matrix. The images were assessed for the controlling the radiotracer uptake in lesion, presence of any radioactive contamination and spread of radiotracer in the neck. Surgical excision was performed 16 hours after following the ^{99m}Tc-MAA injection in to the SPA. The intraoperative hand-held gamma probe (GP) (C-Trak System, Care Wise, Morgan Hill, California, USA) was used to detect the SPA. The patient's neck was scanned with the gamma probe to localize the area of maximal radioactivity allowing appropriate location of the incision over the lesion. The hot area was identified by a GP. Operation was done under local anestesia. Careful dissection was carried out following the area of maximum radioactivity until the parathyroid lesion were identified and excised. After the SPA were removed, radioactivity was measured in the lesion bed to confirm the success of the dissection.

CASE

A 75-year-old woman who had undergone bilateral subtotal thyroidectomy for multinodular goitre was referred to our clinic for parathyroid scintigraphy due to PHPT. Serum PTH level was 362.3 pg/ml and Ca level was 11.2 mg/dl. Dual phase Tc-99m sestamibi scintigraphy was applied 20 and 120 min after the intravenous injection of 20 mCi ^{99m}Tc. Dual head gamma camera (E-cam, Siemens, Erlangen, Germany) equipped with low-energy high-resolution parallel hole collimators was used for image acquisition. Planar static images of the anterior view of the neck and mediastinum, at a matrix size of 128 × 128, were obtained with the patient in the supine position for 10 min. There was not any Tc-99m sestamibi uptake compatible with SPA in the neck or mediastinum. Ultrasonographic (USG) evaluation revealed a hypoecoic round lesion, located at the right thyroid bed and superior to the thyroid remnant, measuring 15 × 10 mm (Figure 1). These findings are suspicious for SPA. USG-guided fine needle aspiration biopsy was performed using 22-gauge needles attached to a 5 ml syringe, inserted to the lesion under USG control. Histopathological analysis revealed parathyroid adenoma. Surgical excision of SPA with ROLL technique using ^{99m}Tc-MAA was applied under local anesthesia. The GP count value of exvivo SPA and background were 1450/10s and 680/10s respectively. Operation time was 20 min. Peroperative pathological diagnosis of excised lesion was confirmed being parathyroid adenoma with frozen section. Serum PTH level was 8.7 pg/ml and Ca level was 8.4 mg/dl on postoperative 1st day.

DISCUSSION

Although bilateral neck exploration is still accepted as the gold standard for treatment of PHPT,

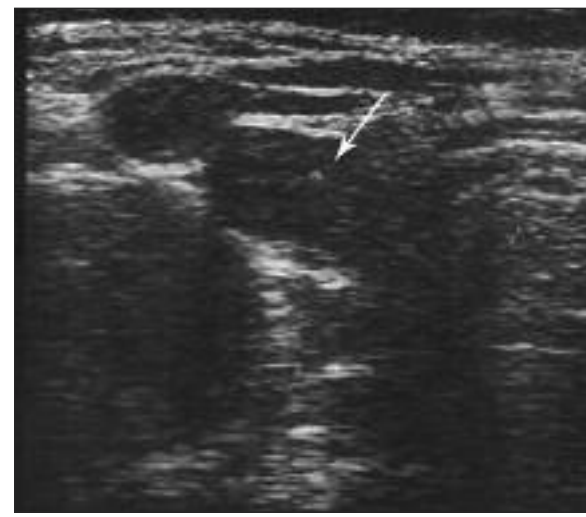

FIGURE 1: Thyriod USG revealed a hypoecoic round lesion, located at the right thyroid bed and superior to the thyroid remnant, measuring 15 × 10 mm (white arrow).

many surgeons consider this procedure an overtreatment, because in most cases PHPT is due to a SPA.[2,7] GP-MIP has emerged as an accepted alternative to standard 4-gland cervical exploration for patients with PHPT.[2-5,8] GP-MIP is also performed on patients with SPA who had undergone previous thyroid or parathyroid surgery, thus limiting the surgical trauma and possible related complications.[9]

One of the causes for the ineffective surgical treatment is failure in localization of SPA.[10] Accurate preoperative localization of the hyperfunctioning parathyroid gland is critical to the success of any targeted surgical approach. However, failure of commonly used preoperative imaging tests to provide definitive localizing information is not infrequent, decreasing the ability to pursue a minimally invasive approach to parathyroidectomy.[11]

USG of the neck is a useful procedure for localizing parathyroid abnormalities. The sensitivity of USG identification of SPA ranges between 70% and 80%, whereas the range is much wider (30-90%) when the detection of simply enlarged parathyroid glands is considered.[12-14] SPA can be visualized in a variety of projections, and USG can be used as a guide to biopsy and fine-needle aspiration.

For detection of SPA, the sensitivity of preoperative imaging with Tc^{99m}-sestambi is generally reported to range from 80% to 95%. Ruda et al reported that sensitivity of sestamibi for SPA was estimated as 88.44% in their metaanalytic study of 160 articles.[15] The development of fast and efficient scintigraphic techniques for pre-operative localisation of SPA, particularly with the use of Tc-99m sestamibi, encouraged the introduction of GP-MIP.

GP-MIP has emerged as an accepted alternative to standard 4-gland cervical exploration for patients with PHPT.[2-5,8] It is offered to patients who have a localized area on ^{99m}Tc-sestamibi scan that is suggestive of a SPA. GP-MIP can be planned in about 60-70% of patients with PHPT when careful patient selection is performed on the basis of accurate preoperative localising imaging.[2,4] The success rates of this method vary from 95% to 100%.[2-5,8]

Unfortunately, some SPA do not retain sestamibi. The over-expression of multidrug resistant protein or p-glycoprotein may be the predominant cause of negative scans on delayed imaging. The other likely cause of failure to observe overactive SPA relates to the size of the SPA with most observers finding it difficult to visualize SPA smaller than 500 mg. The presence of mitochondria-rich oxyphil cells presumably accounts for sestamibi uptake in SPA, and fewer oxyphil cells, and hence fewer mitochondria may account for both lower uptake and rapid washout of sestamibi from the SPA.[16-18] USG provides complementary information to nuclear medicine scanning and combined use of USG and parathyroid scintigraphy increases the sensitivity and specifity of preoperative detection of the SPA especially in patients with concominant nodular thyroid disease.[19] Furthermore, sestamibi negative SPA can be detected with USG.[11]

Conventional surgical treatment of ^{99m}Tc-sestamibi negative SPA is unilateral (USE) or bilateral surgical exploration (BSE).[20,21] ROLL technique may prevent surgical complications such as larengeal nevre injury, vascular injury, hypoparathyoidism which was seen in patients who had undergone BSE or USE especially in patients with extensive scarring related to previous surgery.[22]

In our case, 1 mCi ^{99m}Tc-MAA was injected in to the SPA under USG guidence 16 hours before the surgery. ROLL technique was applied for detection and excision treatment of Tc-99m sestamibi negative SPA under local anesthesia.

This method enables to directly localize SPA, in a short time, without unnecessary dissection of the patient having ^{99m}Tc-sestamibi negative SPA with prior neck operation. We think that ROLL technique is an alternative to conventional methods for the treatment of ^{99m}Tc-sestamibi negative SPA.

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